Update 3 on Plug Door Simulations

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fsPHENIX Meeting

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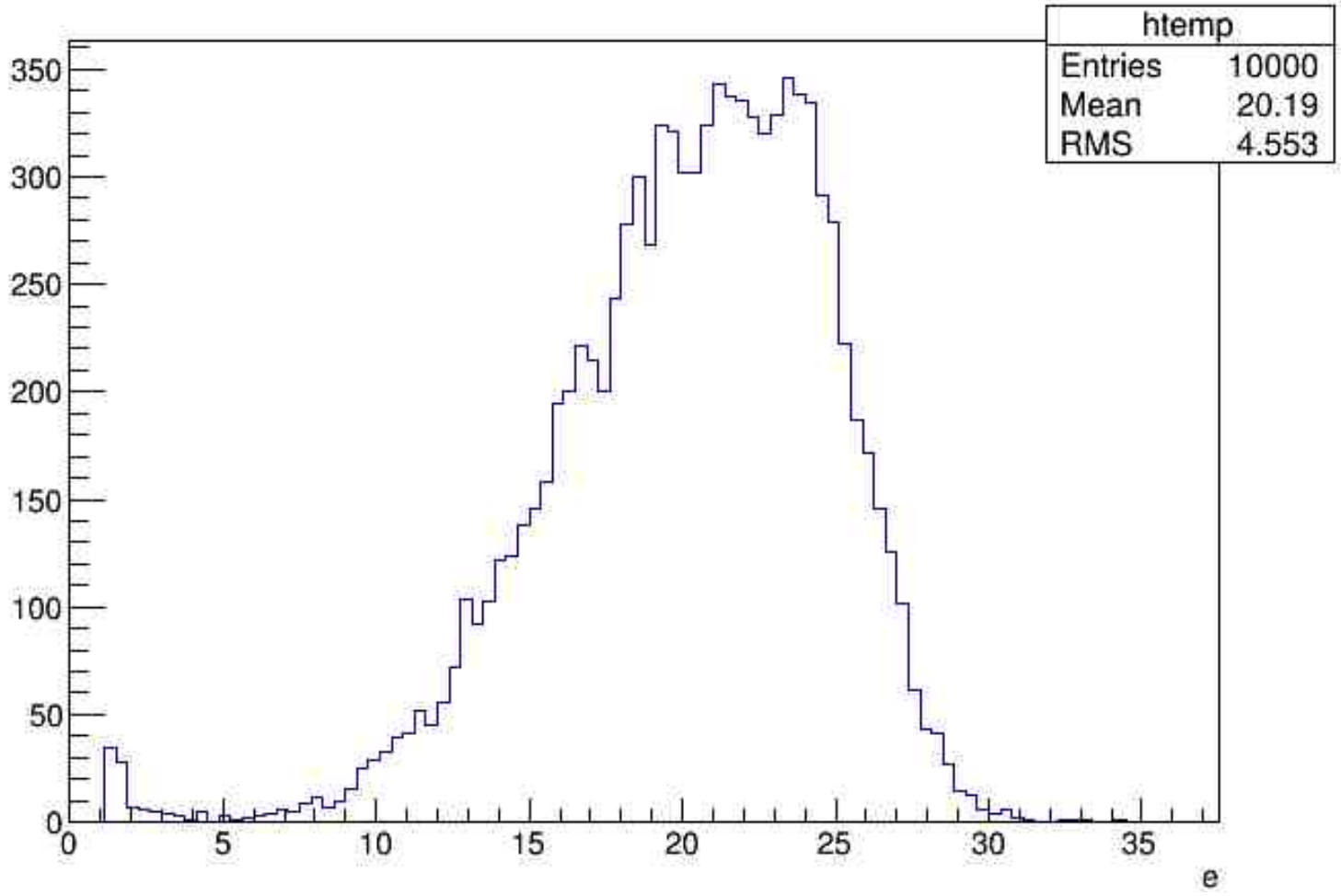
Quick Update/Info

- Purpose was to change plug door dimensions to see how it affects the energy lost by the particles going through it
- Further Discussion ruled that the plug door was behaving as expected and that there is not much space to change the thickness
- This time looked at energy resolution for charged pions of different incoming energy
- Ran simulations with π^- at energies 10-120 GeV in 10 GeV steps keeping the plug door dimension its default values

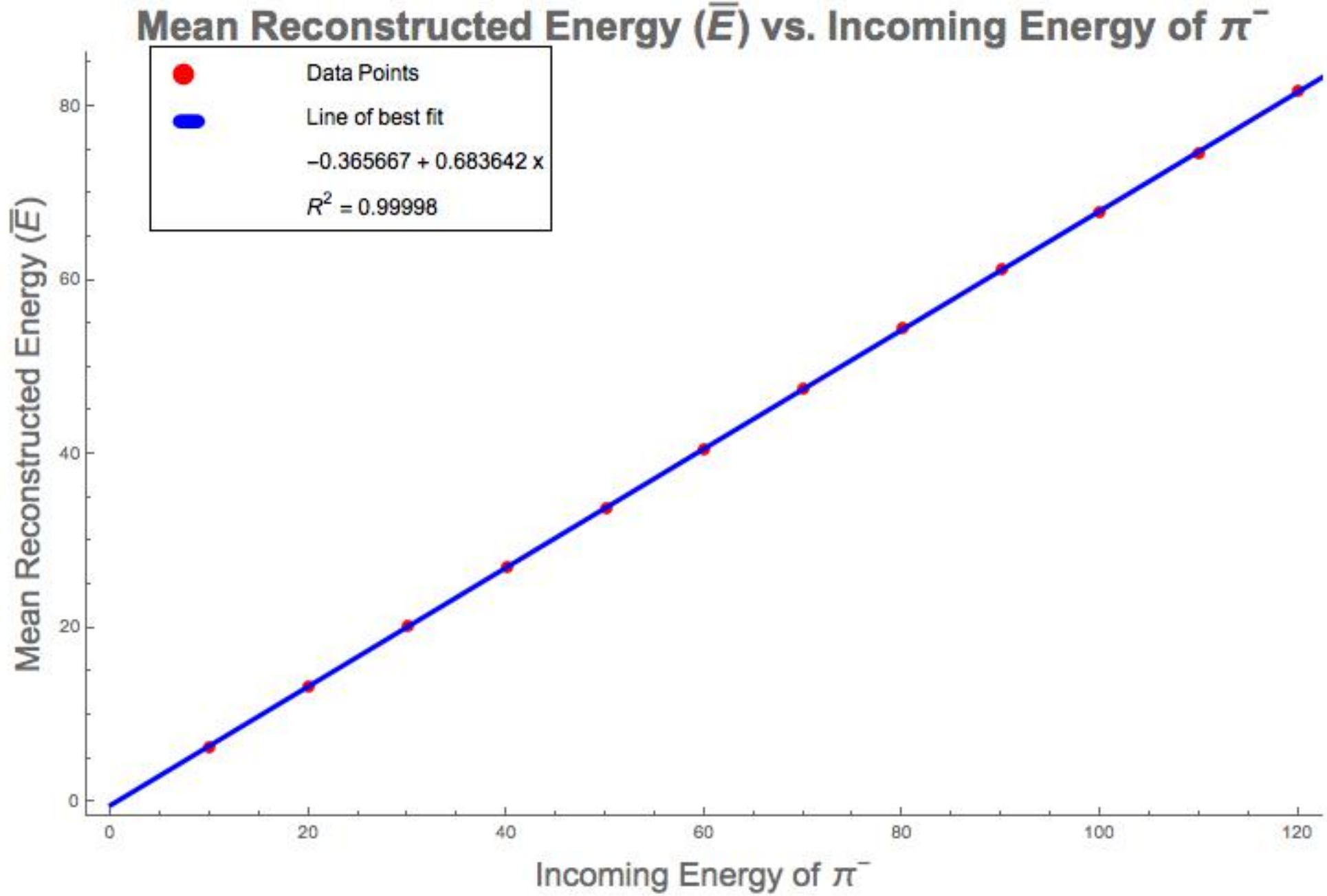
Sample of Root Histogram from Simulations

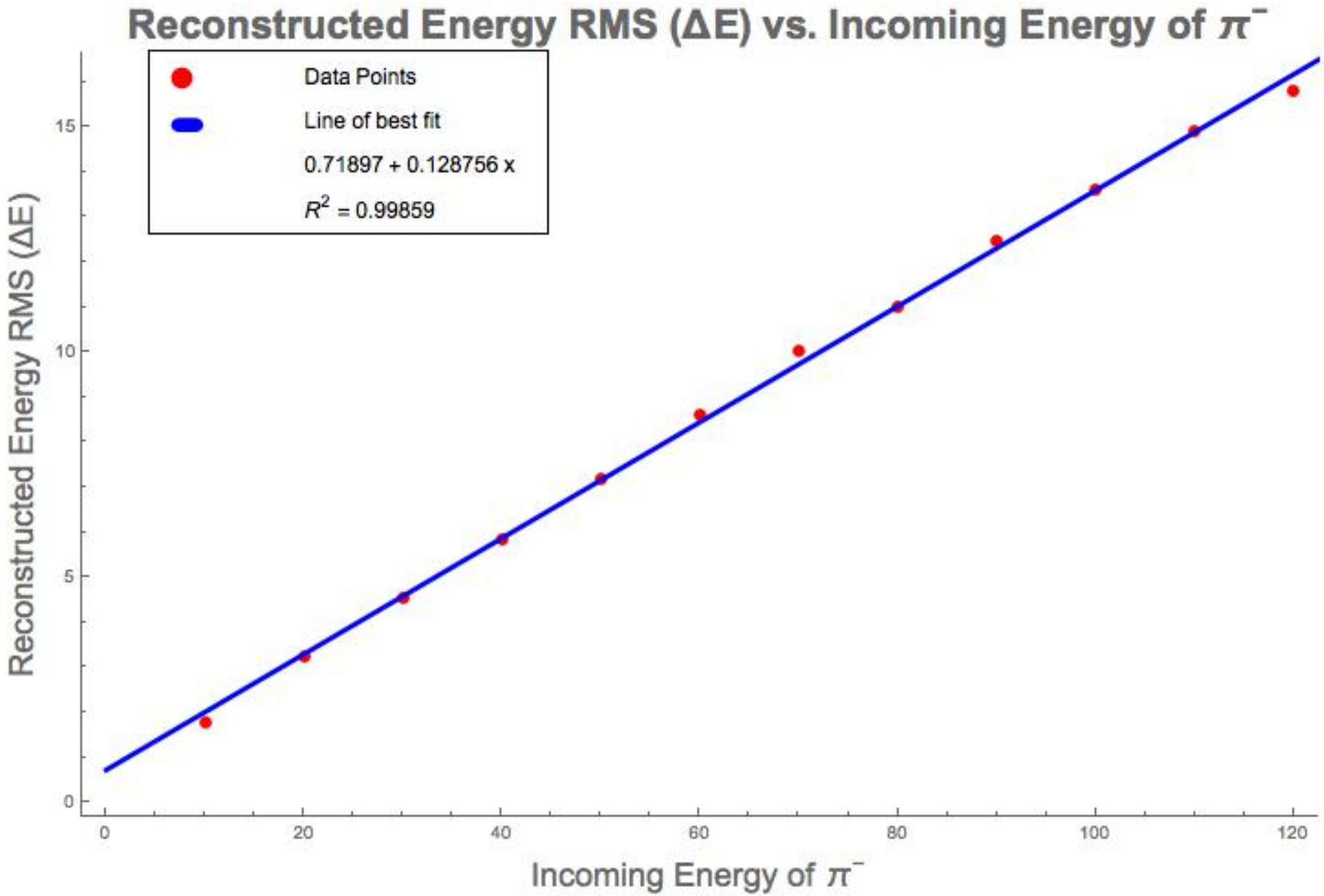
- This is an example of what the histograms looked like after the simulations
- This is the 10 GeV π^- incoming energy case
- The x-axis is the reconstructed energy
- The y-axis is the counts
- See Backup slides for all the histograms

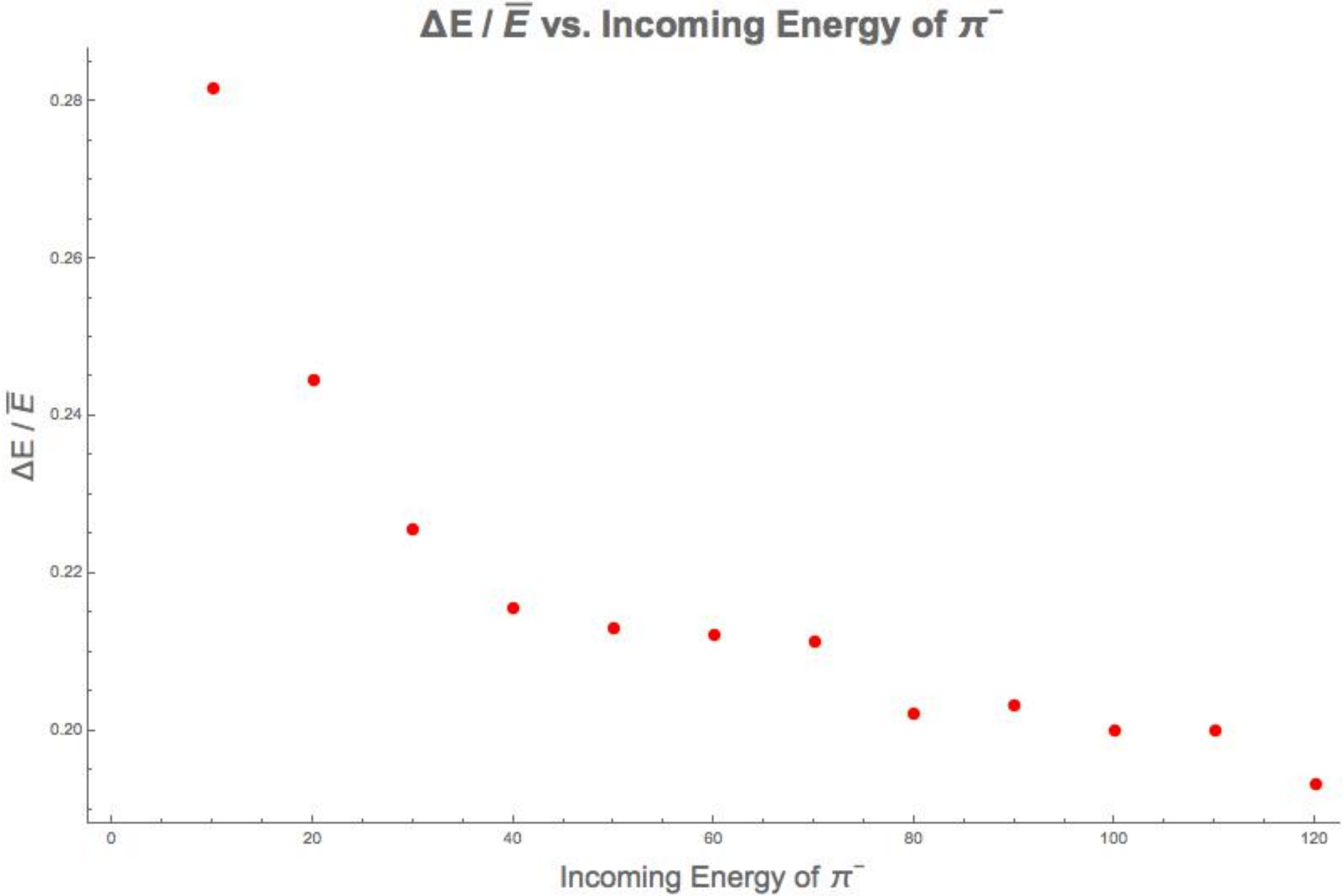


What I did with the Data

- Read off the Mean ($\bar{E}$) and RMS (ΔE) values from root histograms
- Plotted the , $\bar{E}$, ΔE, $\Delta E/\bar{E}$ as a function of the incoming π^- energy
- Did linear fits to those plots that looked linear
- This includes all of the plots except $\Delta E/\bar{E}$


Mean Reconstructed Energy ($\overline{E}$) vs. Incoming Energy of π^-
Data Points
Line of best fit
−0.365667 + 0.683642 x
R^2 = 0.99998
Mean Reconstructed Energy ($\overline{E}$)
Incoming Energy of π^-
0
20
40
60
80
100
120


Reconstructed Energy RMS (ΔE) vs. Incoming Energy of π⁻
Data Points
Line of best fit
0.71897 + 0.128756 x
R² = 0.99859
Reconstructed Energy RMS (ΔE)
Incoming Energy of π⁻
0
5
10
15
0
20
40
60
80
100
120


ΔE / $\bar{E}$ vs. Incoming Energy of π^-
ΔE / $\bar{E}$
0.28
0.26
0.24
0.22
0.20
0
20
40
60
80
100
120
Incoming Energy of π^-

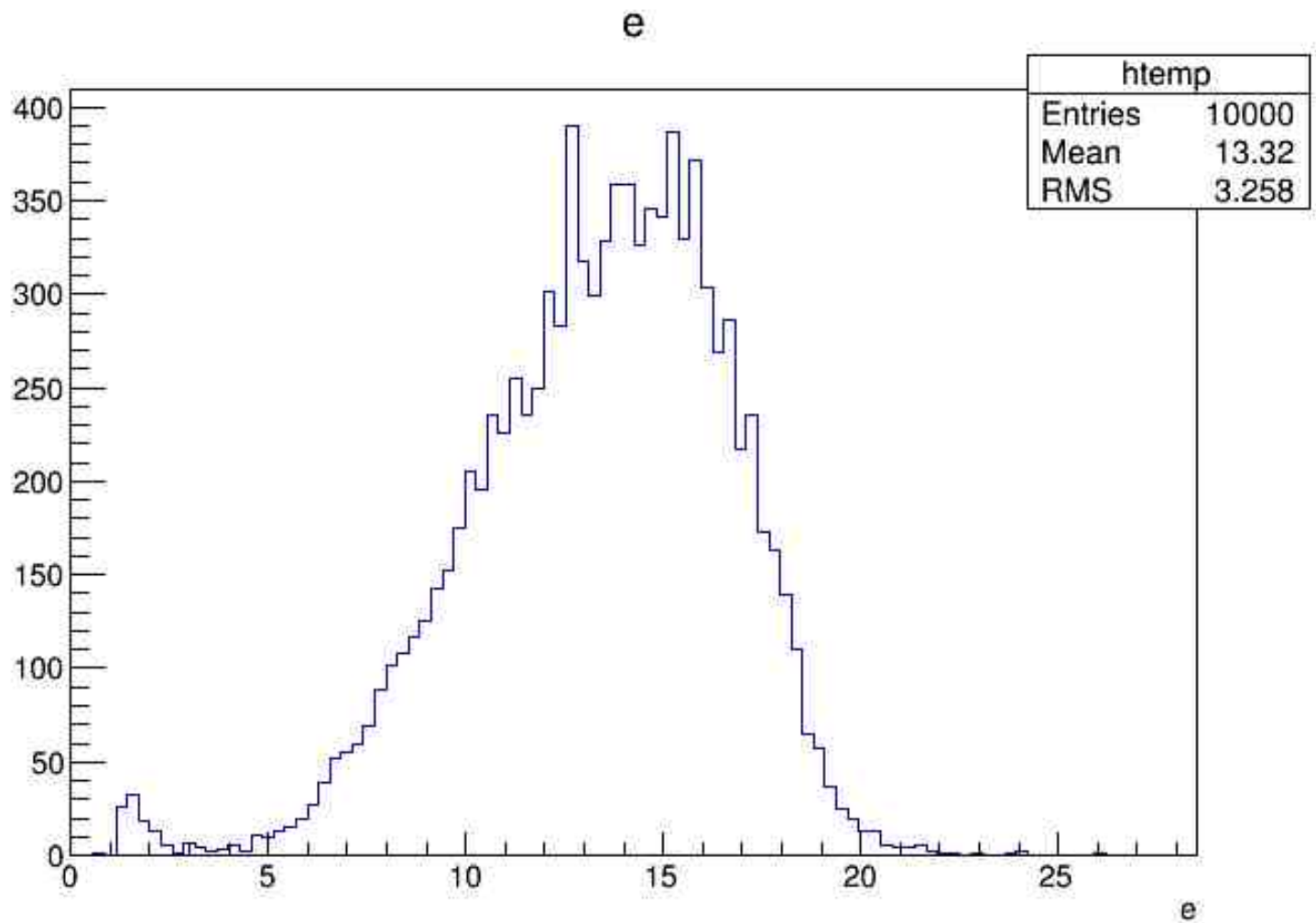
Conclusions and Future Goals

- The plots show a linear relationship for ΔE and $\bar{E}$ vs. pion energy
- This means as the incoming energy gets larger so do the resolution and reconstructed energies as expected
- $\Delta E/\bar{E}$ shows an exponential decay
- Not sure what this means or if it is expected
- Suggestions for future work are welcome

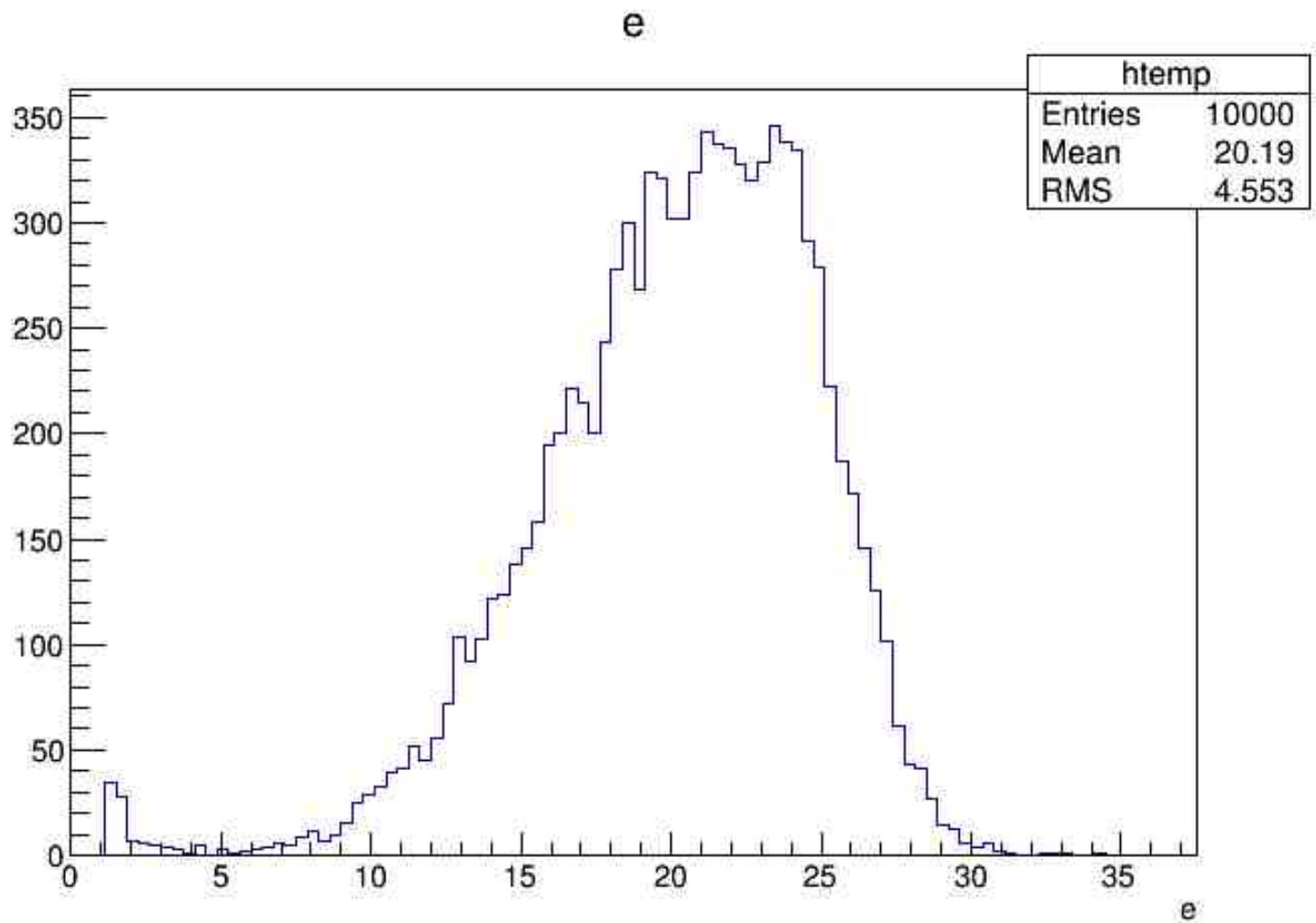
Backup Slide

- The following slides contain the rest of the histograms from the simulations
- Old slides can be found in the June 14, 2016 meeting

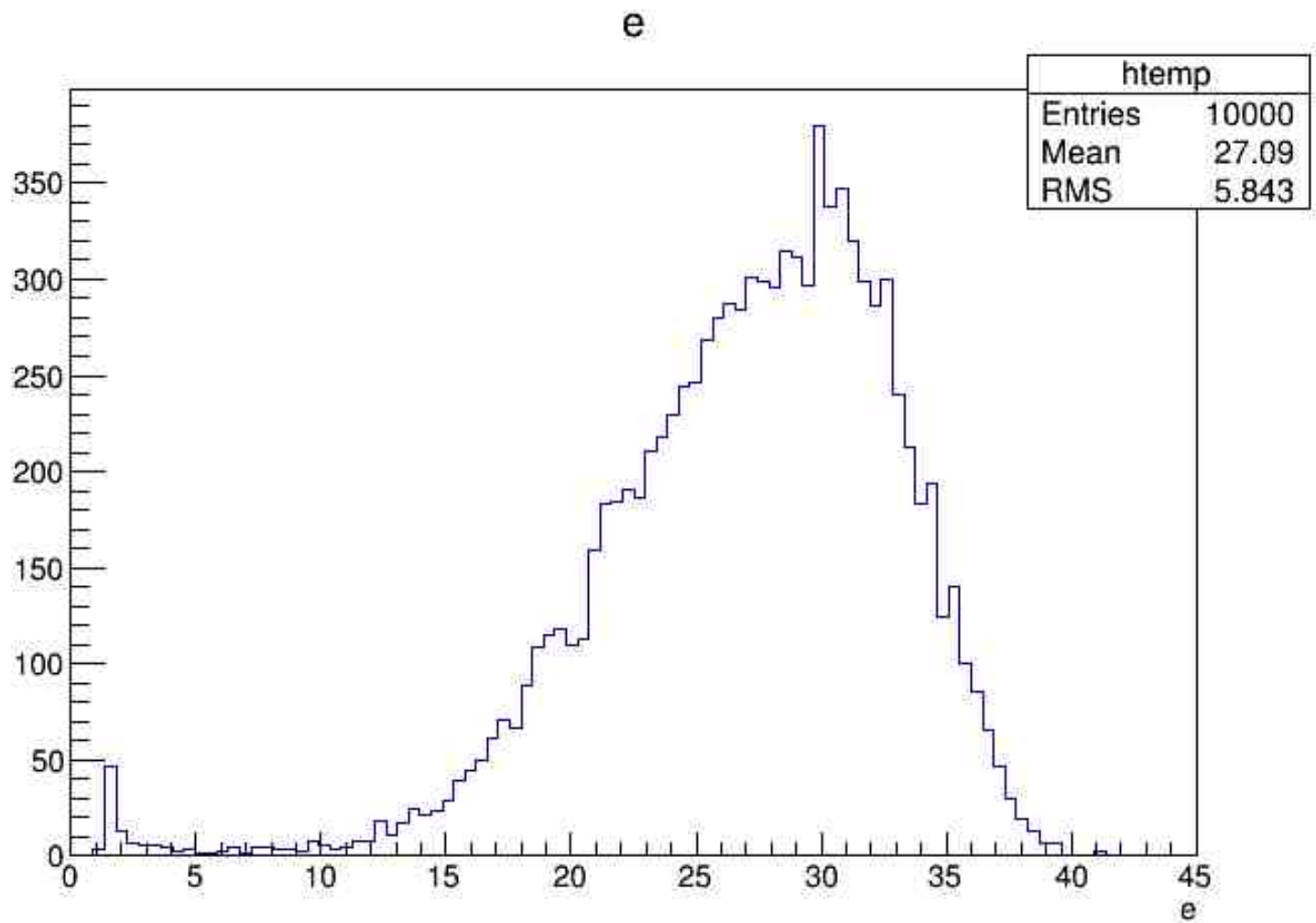
20 Gev


e
htemp
Entries 10000
Mean 13.32
RMS 3.258
400
350
300
250
200
150
100
50
0
0
5
10
15
20
25
e

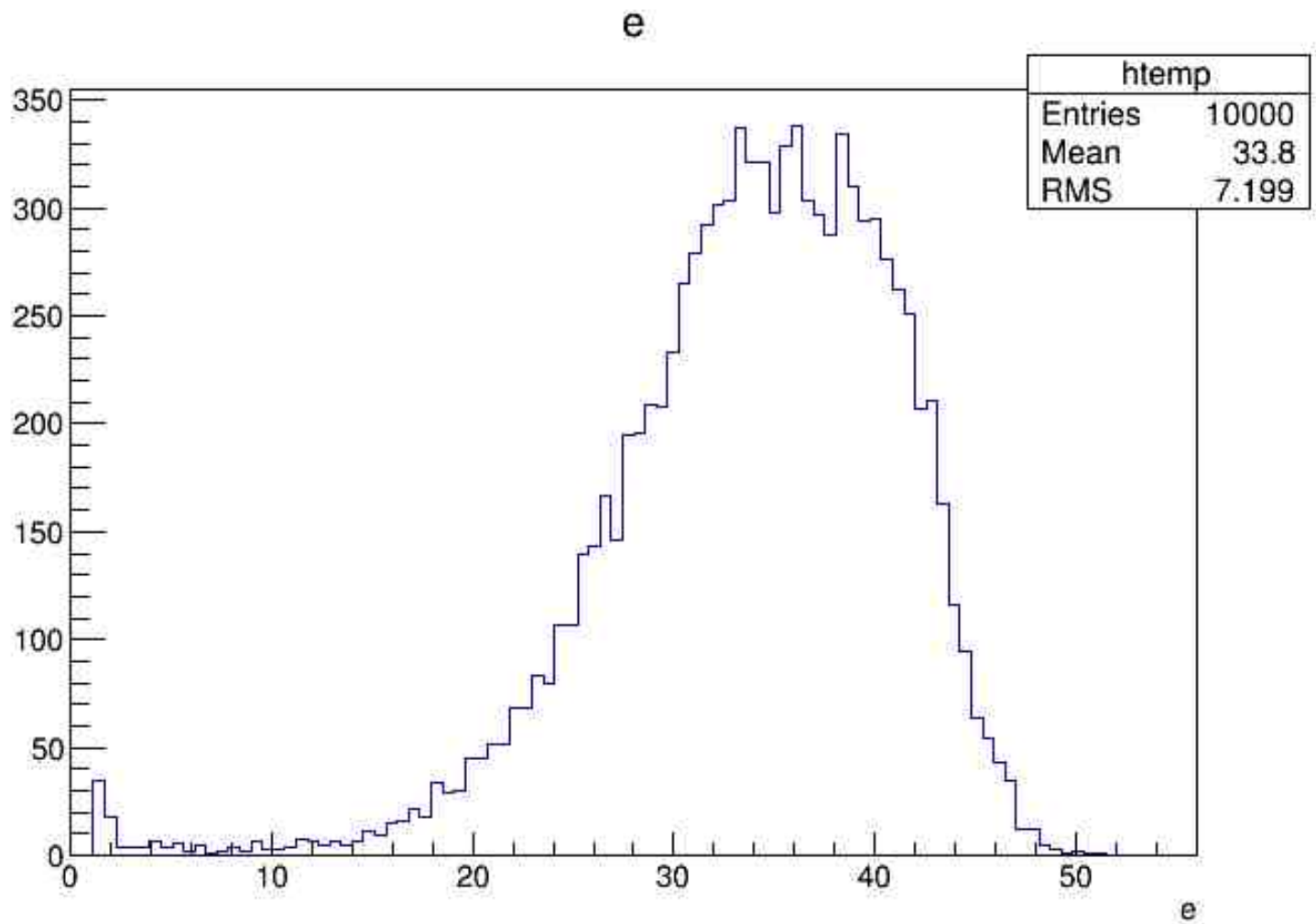
30 Gev


e
htemp
Entries 10000
Mean 20.19
RMS 4.553
350
300
250
200
150
100
50
0
0
5
10
15
20
25
30
35
e

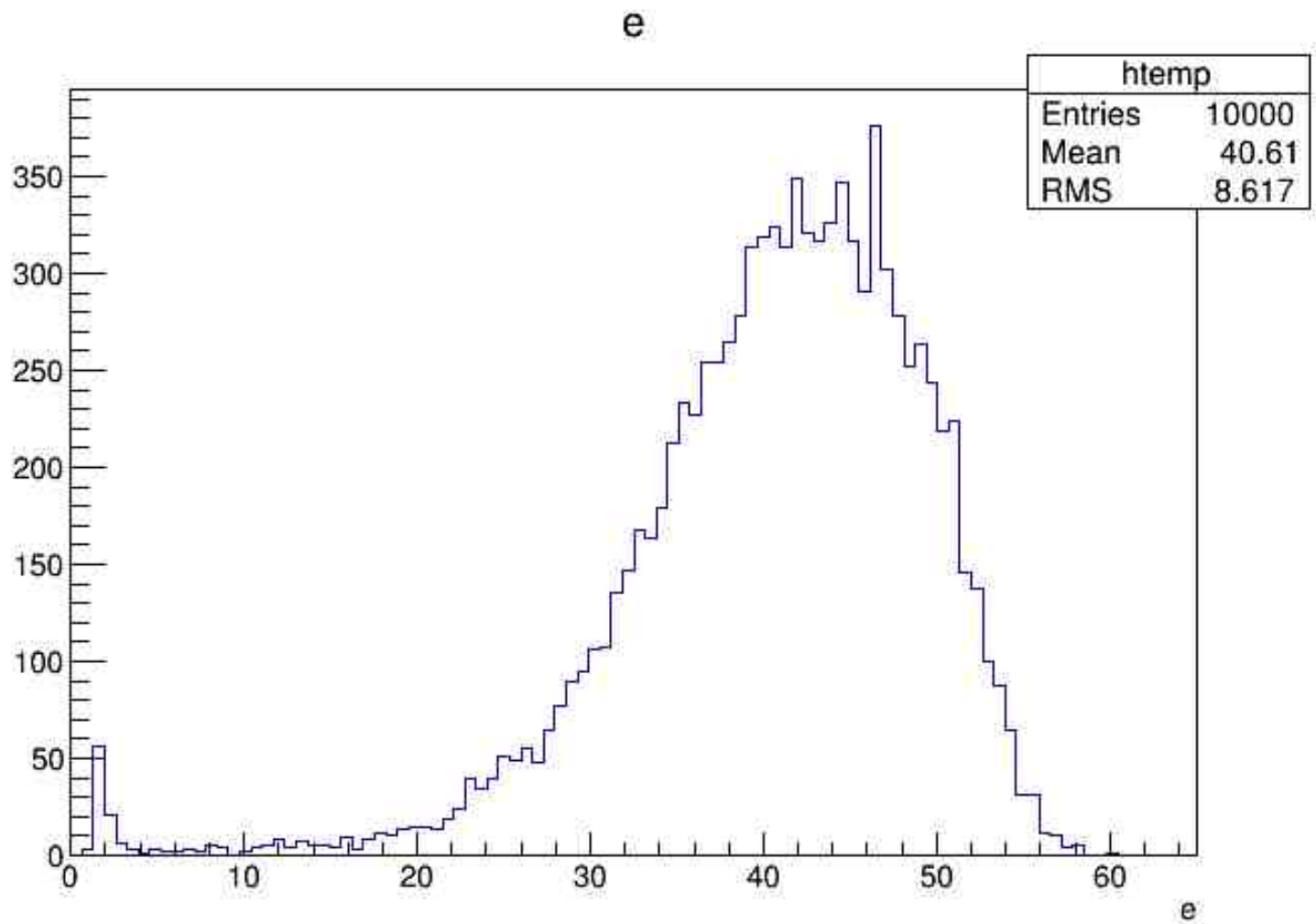
40 Gev


e
htemp
Entries 10000
Mean 27.09
RMS 5.843
350
300
250
200
150
100
50
0
0
5
10
15
20
25
30
35
40
45
e

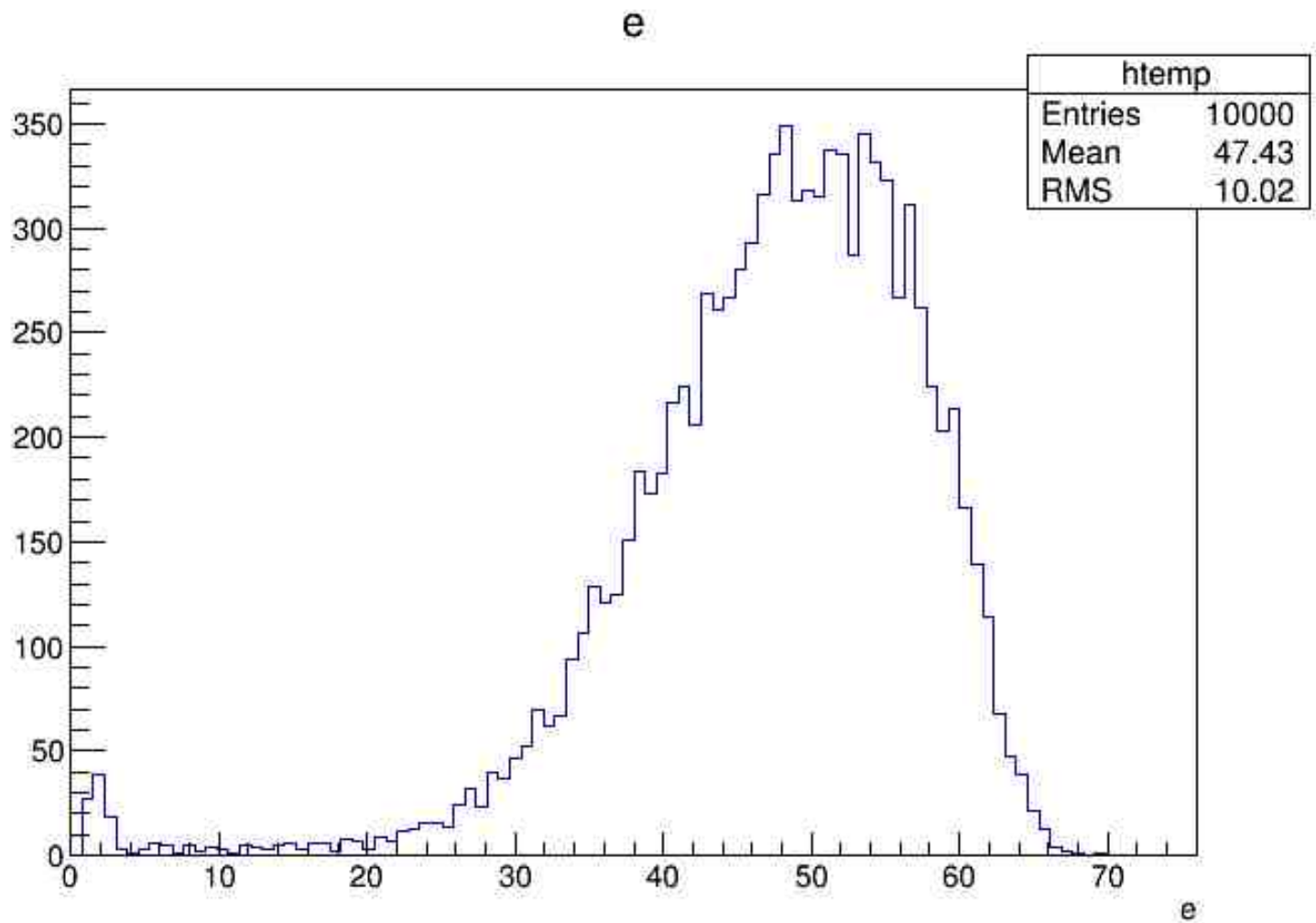
50 Gev


e
htemp
Entries 10000
Mean 33.8
RMS 7.199
350
300
250
200
150
100
50
0
0
10
20
30
40
50
e

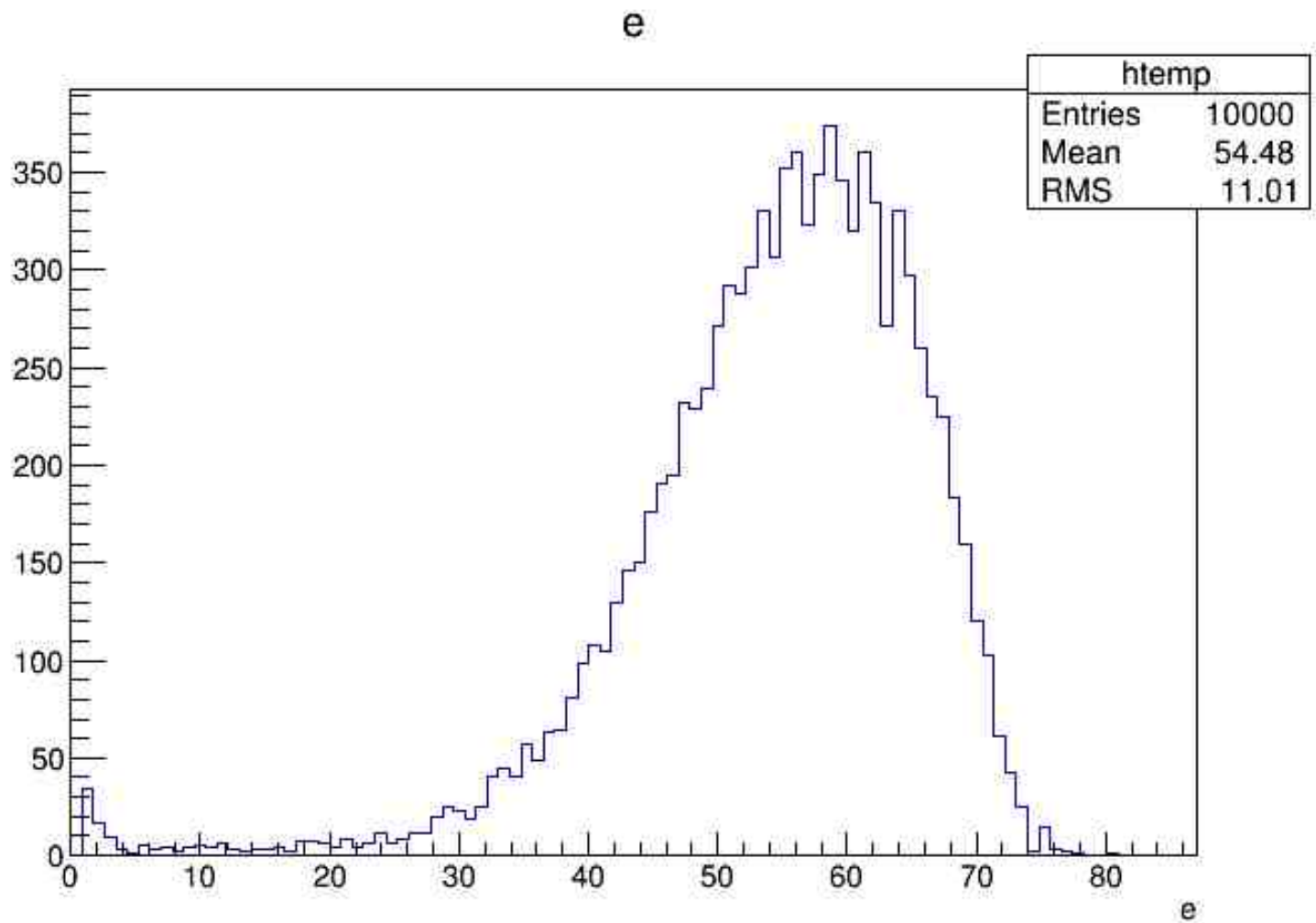
60 Gev


e
htemp
Entries 10000
Mean 40.61
RMS 8.617
350
300
250
200
150
100
50
0
0
10
20
30
40
50
60
e

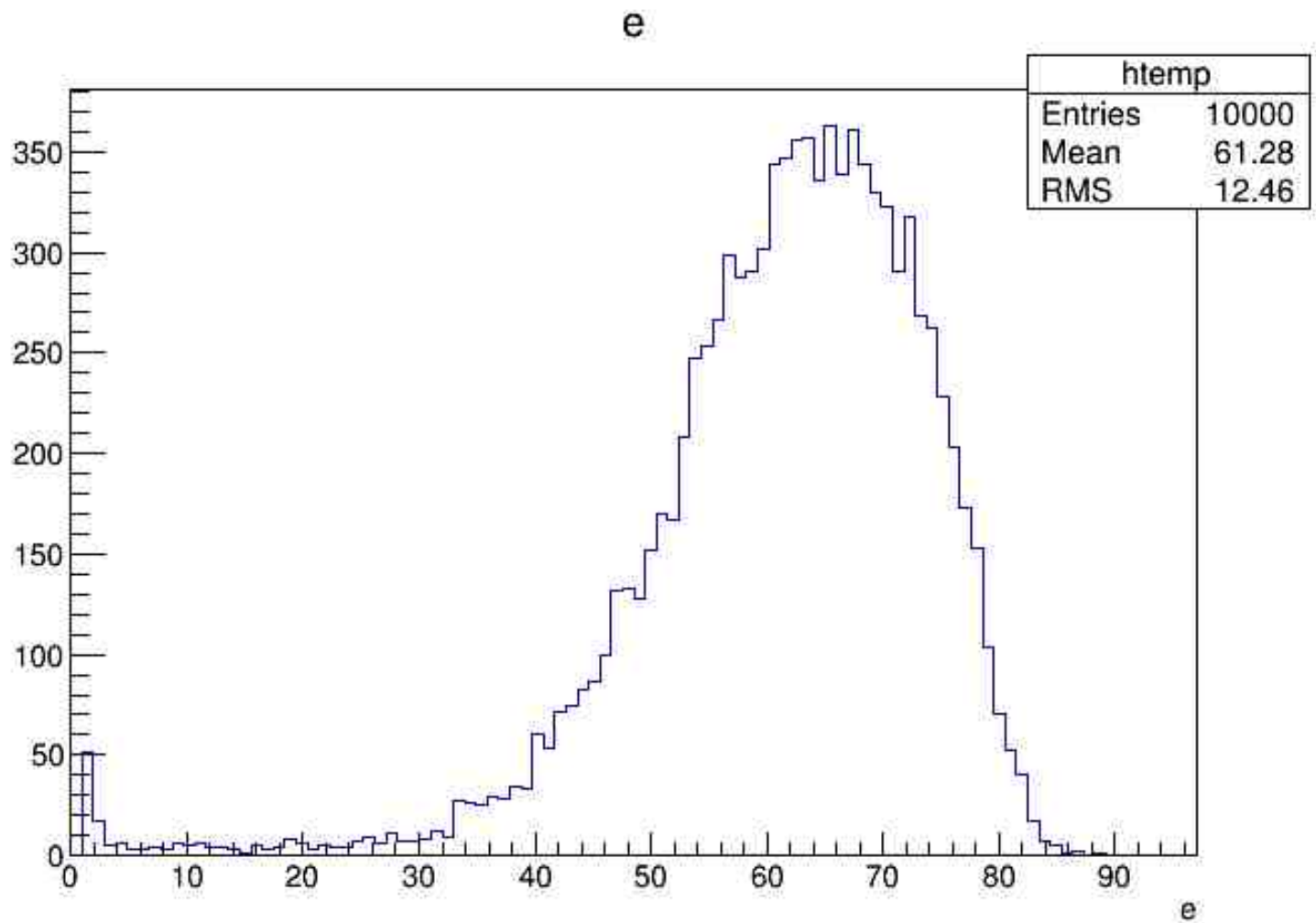
70 Gev


e
htemp
Entries 10000
Mean 47.43
RMS 10.02
350
300
250
200
150
100
50
0
0
10
20
30
40
50
60
70
e

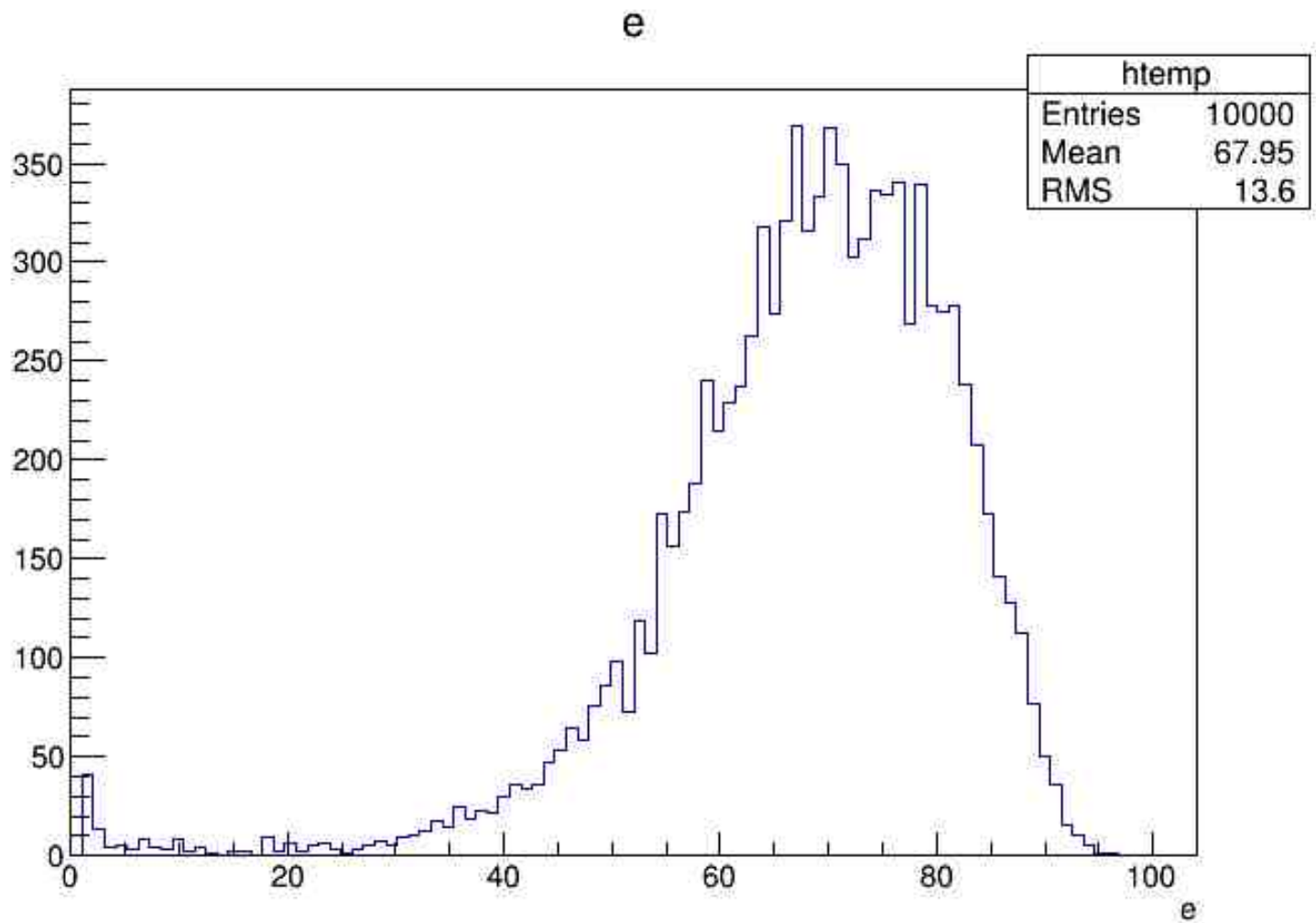
80 Gev


e
htemp
Entries 10000
Mean 54.48
RMS 11.01
350
300
250
200
150
100
50
0
0
10
20
30
40
50
60
70
80
e

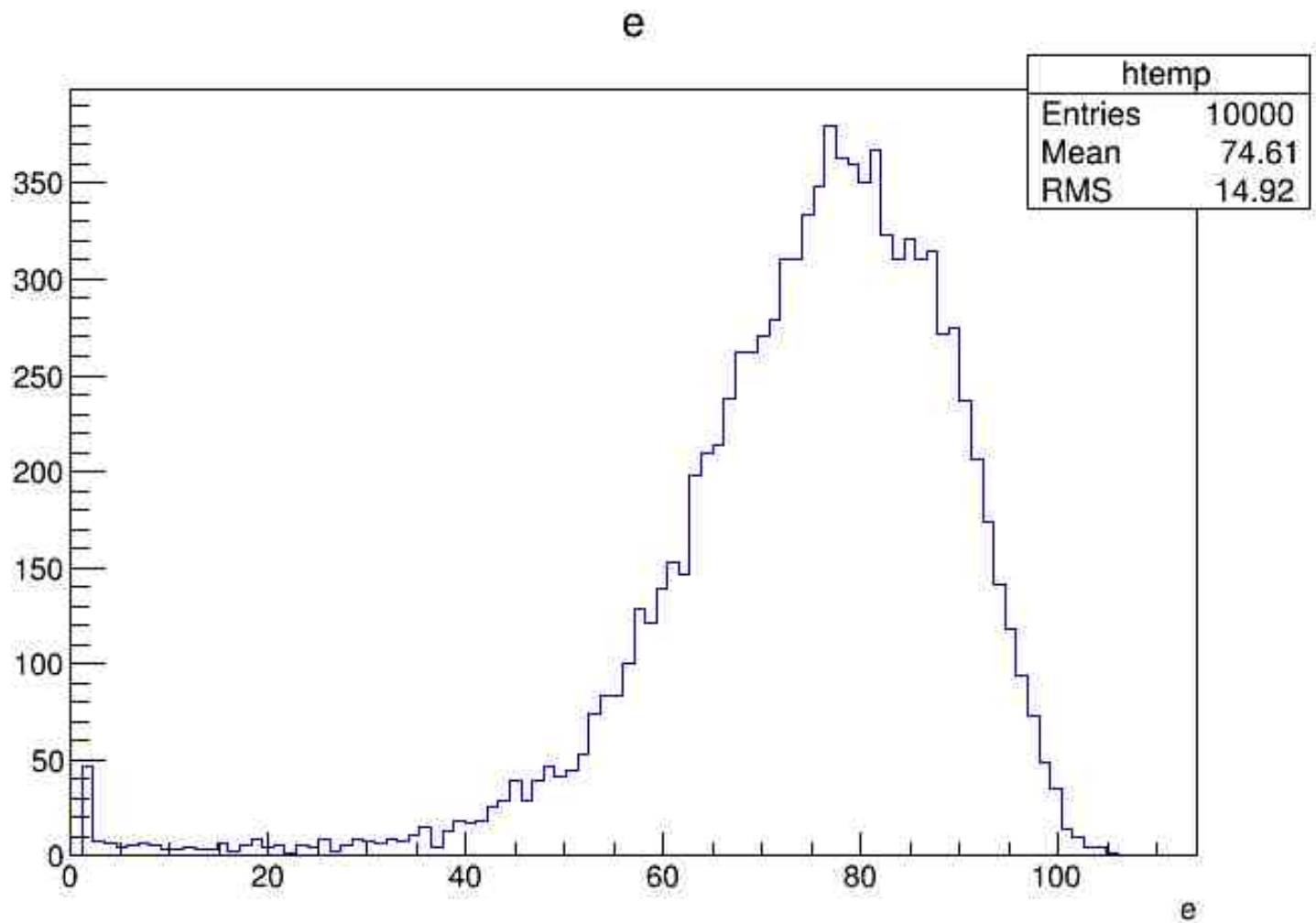
90 Gev


e
htemp
Entries 10000
Mean 61.28
RMS 12.46
350
300
250
200
150
100
50
0
0
10
20
30
40
50
60
70
80
90
e

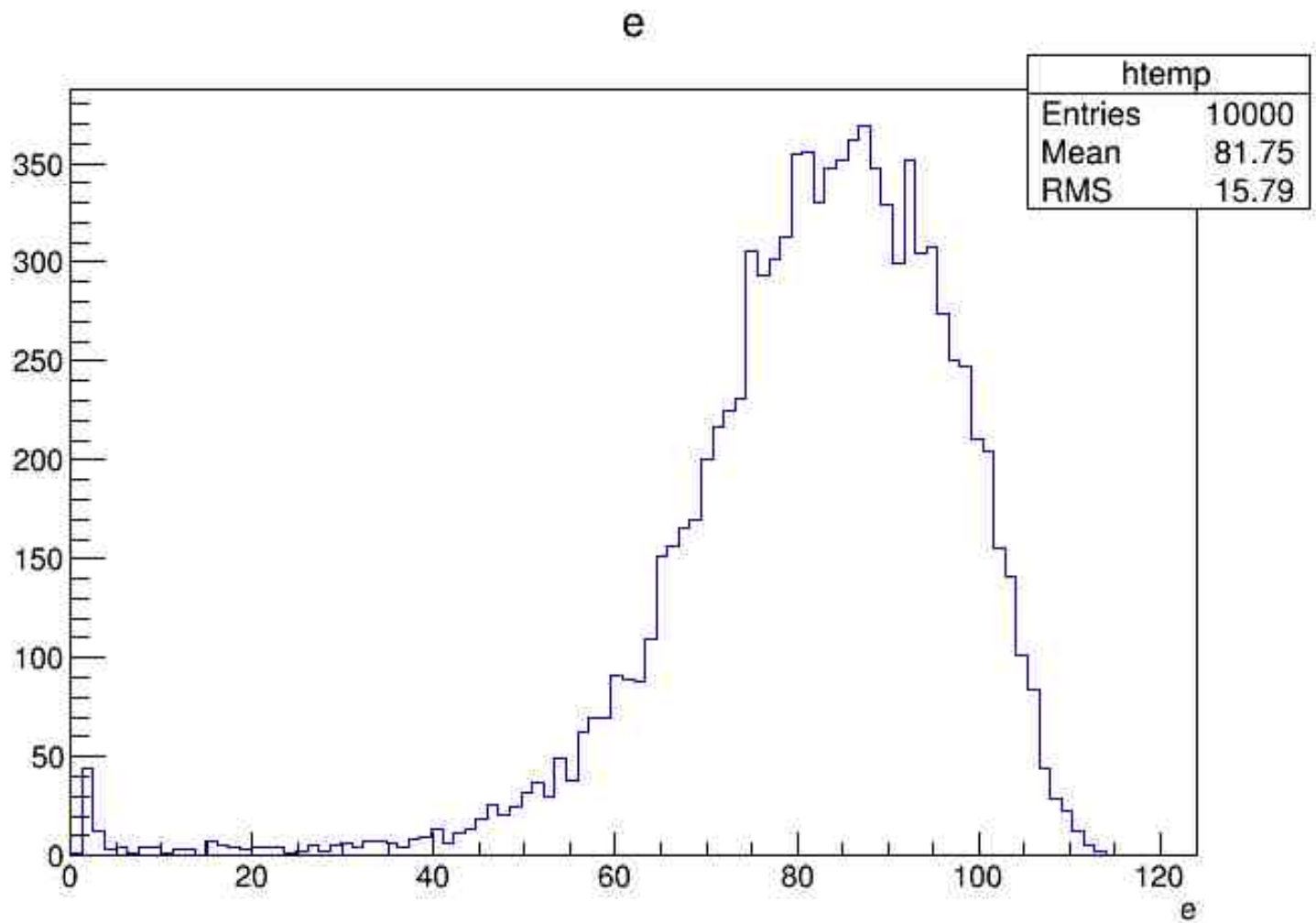
100 Gev


e
htemp
Entries 10000
Mean 67.95
RMS 13.6
350
300
250
200
150
100
50
0
0
20
40
60
80
100
e

110 Gev


e
htemp
Entries 10000
Mean 74.61
RMS 14.92
350
300
250
200
150
100
50
0
0
20
40
60
80
100
e

120 Gev


e
htemp
Entries 10000
Mean 81.75
RMS 15.79
350
300
250
200
150
100
50
0
0
20
40
60
80
100
120
e